liquid introduced to the chamber can rise to the top of the chamber and be expelled via vent port **3150**. Bubble-free liquid is then expelled via outlet **3145**. Optionally, outlet conduit **3145** is omitted; in this case a liquid is admitted via inlet conduit **3140**, bubbles are expelled via vent port **3150** and the liquid is then expelled back through inlet conduit **3140**. Optionally, an air-permeable but water-impermeable membrane (e.g., a membrane made from Gortex material) is placed between inlet **3140** and vent port **3150**. When a liquid passes through the conduit that contains bubbles or is present in a stream that is segmented by slugs of gas, the gas/bubbles will pass through the membrane and exit through vent port **3150** (preferably, the process is aided by applying suction at vent port **3150**) to ensure that liquid is not expelled via vent port **3150** (the optional membrane is shown as membrane **3190**).

[0227] The fluidic conduits can be located at any position within the cartridge and oriented at any angle. Advantageously, the fluidic channels are located, primarily, in planar networks, preferably located proximate to the outside surfaces (e.g., the top **901**,**902** or bottom **903** surfaces of the cartridge shown in FIGS. **11***a-c*) to allow for a multi-layered cartridge design that uses, e.g., machined, die-cut, laser-cut and/or molded cartridge body components. Preferred conduit geometries include conduits with cross-sections that are circular, oval, square or rectangular in cross-section. The width is, preferably, similar to the height so as to minimize the surface area for a particular cross-sectional area. Width and height can vary widely from nm to cm ranges depending on the application, sample volume and cartridge design. Preferred ranges for the width and height are 0.05 to 10 mm, more preferably, 0.5 to 3 mm, most preferably 1 to 2 mm. Cartridges adapted to low volume samples such as blood from finger pricks may have small conduits, preferably having height/widths<1 mm, preferably between 0.4 to 1.0 mm.

[0228] The fluidic channels preferably make use of "Z-transitions" that route the fluid flow path between planes. A conduit with such a Z-transition may comprise first, second, and third conduit segments arranged in sequence, the first and third conduit segments being located in different planar fluidic networks and the second conduit segment connecting the two fluidic networks and arranged at an angle to the other two segments. By way of example, "Z-transitions" (denoted in FIG. **9** as capillary breaks) route the fluid flow/path, in the cartridge shown in FIGS. **11***a-c*, from fluidic conduits near the upper surface **901**, **902** to fluid conduits near the bottom **903** surface and vice a versa. Z-transitions are advantageous in that they provide capillary breaks (as described below) and allow for more complicated fluidic networks than would be possible if the fluidic conduits were confined to one plane. Selective use/placement of capillary breaks, preferably Z-transitions, may be used to control the passive flow of fluids and prevent mixing of fluid streams. Certain preferred embodiments of the invention employ "double Z-transitions", that is conduits that comprise a first Z-transition that directs fluid flow from a first planar network to a second planar network, a second Z-transition that redirects fluid flow back to the first planar network and a connecting segment in the second planar network that connects the two Z-transitions. Such a double Z-transition may comprise first, second, third, fourth and fifth conduit segments arranged in series, the first and fifth segments located in a first planar fluidic network, the third segment located in a second planar fluidic network, the second and fourth segments located so as to direct flow between the two planar networks.

[0229] The fluidic network may be formed within the cartridge in a number of different ways, dependent, in part, upon the materials chosen for the cartridge. Any known fabrication method appropriate to the cartridge body material may be employed including, but not limited to, stereolithography, chemical/laser etching, integral molding, machining, lamination, etc. Such fabrication methods may be used alone or in combination. In certain embodiments of the invention, the cartridge comprises a cartridge body and one or more cover layers mated to surfaces of the cartridge body so as to define one or more fluidic networks (preferably, planar fluidic networks) therebetween. Similarly, Z-transitions and/or ports can be selectively molded into, or machined out of, the cartridge body at predetermined locations to form the fluidic connections between the channels on the upper and lower surfaces.

[0230] One preferred embodiment of the cartridge may be fabricated using a "lamination" process whereby the cartridge body's functional surfaces are sealed using cover layers to form the fluidic network. For example, recesses (e.g., channels, grooves, wells, etc.) in one or more surfaces of the cartridge body provide what is referred to herein as "functional surfaces". Sealing/mating of the functional surfaces to cover layers forms a fluidic network comprising fluidic components (e.g., conduits, chambers, etc.) at least some of which are defined in part by the recesses in the cartridge body and in part by a surface of a cover layer. The cover layers are preferably comprised of plastic film such as mylar film. The cover layer may be coated with an adhesive to seal the cover layer against the cartridge layer. Other methods for mating the cover layer to the cartridge body will be known to the skilled artisan, e.g., the seal may be achieved by heat sealing, ultrasonic welding, RF (radio frequency) welding, by solvent welding (applying a solvent between the components that softens or partially dissolves one or both surfaces), by use of an intervening adhesive layer (e.g., a double sided adhesive tape, etc.). Advantageously, cartridge features that are created by patterned deposition (e.g., patterned deposition of electrode or dielectric layers and/or patterned deposition of reagents to form dry reagent pills or to form binding domains with immobilized binding reagents) are created on cover layers so as to take advantage of automation available to process plastic film in large sheets or rolls.

[0231] Recesses may be, e.g., molded in, etched in or machined from the cartridge body. By analogy, fluidic components may also be defined, at least in part, by recesses in a cover layer that is mated to a cartridge body. Fluidic components may also be defined, at least in part, by regions cutout from gasket layers disposed between the cartridge body and cover layers. Apertures in the cartridge body and/or cover layers may be used to provide for access ports to the fluidic network, e.g., sample introduction ports, vent ports, reagent addition ports and the like. Vent ports, preferably, allow the equilibration of fluid in the chambers with the atmosphere or to allow for the directed movement of fluid into or out of a specified chamber by the application of positive or negative pressure. Vent ports, preferably, are designed to prevent the leakage of liquid samples or reagents through the ports and may include aerosol-resistance filters, membrane or filter materials that permit air flow but act as barriers to aqueous solutions (e.g., filter or membranes made from porous hydrophobic materials such as Cortex), and materials that are